

What is claimed is:

1 1. An organic device comprising:
2 a substrate or a dielectric layer;
3 a photoresist layer formed on the substrate or
4 dielectric layer, wherein the photoresist
5 layer is provided with a plurality of
6 microgrooves having an alignment direction;
7 an organic semiconducting layer having alignment
8 formed on the photoresist layer, wherein the
9 organic semiconducting layer aligns according
10 to the alignment direction of the microgrooves
11 of the photoresist layer; and
12 an electrode.

1 2. The organic device as claimed in claim 1, wherein
2 the plurality of microgrooves are located in different
3 regions of the substrate, and wherein the microgrooves in
4 the same region have the same alignment direction and the
5 microgrooves in different regions have the same or
6 different alignment directions.

1 3. The organic device as claimed in claim 2, wherein
2 the plurality of microgrooves include first
3 microgrooves aligned according to a first
4 direction in a first region and second
5 microgrooves aligned according to a second
6 direction in a second region, wherein the first
7 and second directions are different; and
8 the electrode includes a source and drain, wherein
9 the source and drain are in contact with the

10 organic semiconducting layer to form a channel
11 between the source and drain, wherein the
12 organic semiconducting layer in the channel
13 region aligns according to the first direction
14 and the organic semiconducting layer in the
15 non-channel region aligns according to the
16 second direction.

1 4. The organic device as claimed in claim 1, which
2 is a top-gate type transistor and comprises:
3 a substrate;
4 a photoresist layer formed on the substrate, wherein
5 the photoresist layer is provided with a
6 plurality of microgrooves having an alignment
7 direction;
8 an organic semiconducting layer having alignment
9 formed on the photoresist layer, wherein the
10 organic semiconducting layer aligns according
11 to the alignment direction of the microgrooves
12 of the photoresist layer; and
13 a source and a drain formed on the organic
14 semiconducting layer to form a channel between
15 the source and drain, wherein the channel has
16 a channel direction the same as the alignment
17 direction of the microgrooves;
18 a dielectric layer formed on the organic
19 semiconducting layer, the source, and drain;
20 and
21 a gate formed on the dielectric layer.

1 5. The organic device as claimed in claim 1, which
2 is a top-gate type transistor and comprises:
3 a substrate;
4 a photoresist layer formed on the substrate, wherein
5 the photoresist layer is provided with a
6 plurality of microgrooves having an alignment
7 direction;
8 a source and a drain formed on the photoresist layer
9 and being in contact with the microgrooves of
10 the photoresist layer respectively;
11 an organic semiconducting layer having alignment
12 formed on the photoresist layer, the source,
13 and the drain, wherein the organic
14 semiconducting layer aligns according to the
15 alignment direction of the microgrooves of the
16 photoresist layer, such that a channel is
17 formed between the source and drain and the
18 channel has a channel direction the same as the
19 alignment direction of the microgrooves;
20 a dielectric layer formed on the organic
21 semiconducting layer; and
22 a gate formed on the dielectric layer.

1 6. The organic device as claimed in claim 1, which
2 is a bottom-gate type transistor and comprises:
3 a substrate;
4 a gate formed on the substrate;
5 a photoresist layer formed on the gate, wherein the
6 photoresist layer is provided with a plurality
7 of microgrooves having an alignment direction;

8 an organic semiconducting layer having alignment
9 formed on the photoresist layer, wherein the
10 organic semiconducting layer aligns according
11 to the alignment direction of the microgrooves
12 of the photoresist layer; and
13 a source and a drain formed on the organic
14 semiconducting layer to form a channel between
15 the source and drain, wherein the channel has
16 a channel direction the same as the alignment
17 direction of the microgrooves.

1 7. The organic device as claimed in claim 6, further
2 comprising a dielectric layer formed between the gate and
3 the photoresist layer.

1 8. The organic device as claimed in claim 1, which
2 is a bottom-gate type transistor and comprises:
3 a substrate;
4 a gate formed on the substrate;
5 a photoresist layer formed on the gate, the
6 photoresist layer is provided with a plurality
7 of microgrooves having an alignment direction;
8 a source and a drain formed on the photoresist layer
9 and being in contact with the microgrooves of
10 the photoresist layer respectively; and
11 an organic semiconducting layer having alignment
12 formed on the photoresist layer, the source,
13 and the drain, wherein the organic
14 semiconducting layer aligns according to the
15 alignment direction of the microgrooves of the
16 photoresist layer, such that a channel is

17 formed between the source and drain and the
18 channel has a channel direction the same as the
19 alignment direction of the microgrooves.

1 9. The organic device as claimed in claim 8, further
2 comprising a dielectric layer formed between the gate and
3 the photoresist layer.

1 10. The organic device as claimed in claim 1, wherein
2 the microgrooves have a depth of 0.3 μm to 1 μm .

1 11. The organic device as claimed in claim 1, wherein
2 the microgrooves have a width pitch of 0.5 μm to 2 μm .

1 12. The organic device as claimed in claim 1, wherein
2 the substrate is a silicon wafer, glass, quartz, a plastic
3 substrate, or a flexible substrate.

1 13. The organic device as claimed in claim 1, wherein
2 the dielectric layer has a dielectric constant higher than
3 3.

1 14. The organic device as claimed in claim 13,
2 wherein the dielectric layer is inorganic material or
3 polymer material.

1 15. A process for forming an organic semiconducting
2 layer having molecular alignment, comprising the
3 following steps:

4 forming a photoresist layer on a substrate or a
5 dielectric layer;

6 subjecting the photoresist layer to a
7 photolithography process through a mask to form

8 a plurality of microgrooves with an alignment
9 direction; and
10 forming an organic semiconducting layer on the
11 photoresist layer having microgrooves, such
12 that the organic semiconducting layer aligns
13 according to the alignment direction of the
14 microgrooves of the photoresist layer.

1 16. The process as claimed in claim 15, wherein the
2 photolithography process forms a plurality of
3 microgrooves in different regions of the substrate,
4 wherein the microgrooves in the same region have the same
5 alignment direction and the microgrooves in different
6 regions have the same or different alignment directions.

1 17. The process as claimed in claim 16, further
2 comprising the following steps:
3 forming first microgrooves aligned according to a
4 first direction in a first region of the
5 substrate, and concurrently forming second
6 microgrooves aligned according to a second
7 direction in a second region of the substrate,
8 wherein the first and second directions are
9 different; and
10 forming a source and a drain, wherein the source and
11 drain are in contact with the organic
12 semiconducting layer having alignment, such
13 that a channel is formed between the source and
14 drain, the organic semiconducting layer in the
15 channel region aligns according to the first
16 direction and the organic semiconducting layer

17 in the non-channel region aligns according to
18 the second direction.

1 18. The process as claimed in claim 15, wherein the
2 substrate is a silicon wafer, glass, quartz, a plastic
3 substrate, or a flexible substrate.

1 19. The process as claimed in claim 15, wherein the
2 organic semiconducting layer is formed by deposition.

1 20. The process as claimed in claim 19, wherein the
2 organic semiconducting layer is formed by vacuum
3 evaporation, vapor deposition, solution deposition, or
4 directional deposition.

1 21. The process as claimed in claim 15, wherein the
2 step of forming the photoresist layer forms the
3 photoresist layer having a thickness of 0.5 μm to 5 μm .

1 22. The process as claimed in claim 21, wherein the
2 microgrooves have a depth of 0.3 μm to 1 μm .

1 23. The process as claimed in claim 21, wherein the
2 microgrooves have a width pitch of 0.5 μm to 2 μm .

1 24. A process for forming an organic device,
2 comprising the following steps:

3 forming a photoresist layer on a substrate or a
4 dielectric layer;

5 subjecting the photoresist layer to a
6 photolithography process through a mask to form
7 a plurality of microgrooves having an alignment
8 direction;

9 forming an organic semiconducting layer on the
10 photoresist layer having microgrooves, such
11 that the organic semiconducting layer aligns
12 according to the alignment direction of the
13 microgrooves of the photoresist layer; and
14 forming an electrode.

1 25. The process as claimed in claim 24, wherein the
2 photolithography process forms a plurality of
3 microgrooves in different regions of the substrate,
4 wherein the microgrooves in the same region have the same
5 alignment direction and the microgrooves in different
6 regions have the same or different alignment directions.

1 26. The process as claimed in claim 25, wherein
2 the photolithography process includes forming first
3 microgrooves aligned according to a first
4 direction in a first region of the substrate,
5 and concurrently forming second microgrooves
6 aligned according to a second direction in a
7 second region of the substrate, wherein the
8 first and second directions are different; and
9 the step of forming the electrode includes forming
10 a source and a drain, wherein the source and
11 drain are in contact with the organic
12 semiconducting layer having alignment, such
13 that a channel is formed between the source and
14 drain, the organic semiconducting layer in the
15 channel region aligns according to the first
16 direction and the organic semiconducting layer

17 in the non-channel region aligns according to
18 the second direction.

1 27. The process as claimed in claim 24, wherein the
2 substrate is a silicon wafer, glass, quartz, a plastic
3 substrate, or a flexible substrate.

1 28. The process as claimed in claim 24, wherein the
2 organic semiconducting layer is formed by deposition.

1 29. The process as claimed in claim 28, wherein the
2 organic semiconducting layer is formed by vacuum
3 evaporation, vapor deposition, solution deposition, or
4 directional deposition.

1 30. The process as claimed in claim 24, wherein the
2 step of forming the photoresist layer forms the
3 photoresist layer having a thickness of 0.5 μm to 5 μm .

1 31. The process as claimed in claim 30, wherein the
2 microgrooves have a depth of 0.3 μm to 1 μm .

1 32. The process as claimed in claim 30, wherein the
2 microgrooves have a width pitch of 0.5 μm to 2 μm .

1 33. The process as claimed in claim 24, wherein the
2 dielectric layer has a dielectric constant higher than 3.

1 34. The process as claimed in claim 33, wherein the
2 dielectric layer is inorganic material or polymer
3 material.

1 35. The process as claimed in claim 24, wherein the
2 organic device is a top-gate type organic thin film
3 transistor (OTFT).

1 36. The process as claimed in claim 24, wherein the
2 organic device is a bottom-gate type organic thin film
3 transistor (OTFT).